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ABSTRACT

The present study attempted to modify the latencies and errors of adult women on the Matching Familiar Figures test (MFF) by systematically altering task instructions. The results indicated that latencies of impulsive subjects could be altered with "reflective" instructions, while the latencies of reflective subjects were resistent to change; instructions did not significantly alter errors of either reflective or impulsive subjects. Test-retest correlations as well as the relative resistance of errors to altered instructions was interpreted as supportive of the generality and stability of the reflection-impulsivity dimension of cognitive style with adults. (Author)

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Cognitive Style in Adults:

The Effects of Different Task Instructions

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Kagan and Kogan's (1970) review of the literature indicates that the dimension of reflection-impulsivity is a reliable and useful dimension along which to conceptualize individual differences in cognitive functioning in tasks with high response uncertainty (i.e. cognitive style). The Matching Familiar Figures Test (MFF) was developed by Kagan and his collaborators (Kagan, Rosman, Day, Albert, and Phillips, 1964) as a reliable means of evaluating a child's relative position on the dimension of reflection-impulsivity. In the MFF, a subject is shown a standard stimulus and is then asked to choose the one of several possible variants that exactly matches the standard. Latency to first response and number of errors on each 12 items are recorded: subjects above the median in mean latency and below the median in total number of errors for a particular age and sex subgroup are designated as reflective; subjects below the median in mean latency and above the median in errors are designated as impulsive. In general, subsequent studies have found that reflective children, compared to impulsive children, have sustained involvement with toys, long fixation times before reacting to a stimulus, tend to prefer low-risk situations, tend to be better able to inhibit motoric responses, and tend to make fewer reading errors (Kagan, 1965; Repucci, 1970; Meichenbaum and Goodman, 1969).

In order to account for the performance difference between reflective and impulsive subjects, Kagan has postulated that the reflective child is more anxious about making an error, causing him to deliberate longer (Kagan and Kogan, 1970); other explanations have hypothesized differences in attentional

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strategies (Drake, 1970; Siegelman, 1969; Zelnicker, Jeffrey, Ault, and Parsons, 1972); and interpretation of instructions (Drake, 1970).

In light of recent research attempting to modify the response times and errors of reflective and impulsive children, it appeared that the instructions and the procedures used might play a significant role in the modification of these behaviors. Kagan, Pearson, and Welch (1966b), Debus (1970), and Yando and Kagan (1968) were successful only in modifying the response times of impulsive children; Meichenbaum and Goodman (1970) and Ridberg, Parke, and Hetherington (1971) were successful in modifying both response times and errors of impulsive children; Zelnicker et al. (1972) were successful only in modifying the errors of impulsive children, Ridberg et al. (1971) increased the number of errors made by reflective children.

Unfortunately, no research has been concerned with the modification of reflective and impulsive functioning in adults. In fact, only one or two studies have used adults as subjects (Drake, 1970); thus little information is available as to the stability of this dimension in adults. The purpose of the present study was to determine the relative stability of the reflection-impulsivity dimension in adults, and to assess the extent to which instructional manipulations could modify the response times and errors of reflective and impulsive adults.

The typical instructions given to subjects on the MFF have been; "I'm going to show you some pictures of some things you know and some pictures that look like them. Point to the picture on the bottom page that is just like the picture on the top page (Kagan, 1965)." Drake (1970) has argued that reflective and impulsive subjects interpret these standard instructions differently, and that these interpretations dictate different task strategies. Drake has suggested that reflective subjects interpret these instructions to

mean ". . . eliminate the items on the bottom page that are different from the standard until only one item remains--it will be just like the standard," and that impulsive subjects interpret the same instructions to mean ". . . if you don't see any difference between an item on the bottom page and the standard, choose that item." Clearly, these different strategies could be expected to produce differential performance reflected in measures of response time and errors.

In order to test Drake's (1970) hypothesis, both reflective and impulsive adults were tested twice on different forms of the MFF: first, with standard instructions; second, retested with standard instructions or with either "reflective" or "impulsive" instructions. It was predicted that on the second administrations of the MFF: 1) response latencies and errors should be stable for both reflective and impulsive subjects when standard instructions are used for both adminstrations; 2) "reflective" instructions should increase response latency and decrease errors of impulsive subjects, but should have no effect on the performance of reflective subjects; 3) "impulsive" instructions should decrease response latency and increase errors of reflective subjects, but should have no effect on the performance of impulsive subjects.

Method

Subjects

One hundred eighteen female undergraduates, enrolled in a course in educational psychology, participated in the research. The final sample consisted of 30 reflective and 30 impulsive females.

Matching Familiar Figures Test (MFF)

Two six-item forms were selected (on an odd-even split) from the adult version of Kagan's Matching Familiar Figures Test. Each item consisted of a standard on the top page, and eight variants of the standard on the bottom page. Seven of these variants differed from the standard in only one minor

feature; the remaining variant was exactly like the standard. Each form of the MFF was presented in a notebook; the notebook was positioned so that the standard (top page) was at a right angle to the variants (bottom page).

Procedure

All 113 subjects were first individually administered one 6-item MFF with the following (standard) instructions: ". . . I'm going to show you some pictures of some things you know and some pictures that look like them. Point to the picture on the bottom page that is just like the picture on the top page. When a subject was correct she was told "correct"; and the next item was presented; when she made an error, she was told "No, try again." For each item, the response latency to the first choice (correct or incorrect) and the number of errors were recorded. Thirty-nine subjects whose mean latencies were above the median and whose total number of errors were below the median were classified as reflective; 33 subjects whose mean latencies were below the median and whose total numbers of errors were above the median were classified as impulsive.

Approximately two weeks after the initial MFF administration, 30 reflectives and 30 impulsives were administered the alternate 6-item form of the MFF (due to time constraints and absenteeism, 9 reflectives and 3 impulsives were not administered the second MFF). Ten reflective and ten impulsive subjects were randomly assigned to one of three instructional conditions:

1. Standard Instructions: "Remember the task you did before? Let's do it again." Identical instructions to those given in the first administration were then given.
2. Reflective Instructions: "Remember the task you did before? Let's do it differently. "I'm going to show you some pictures of some things you know and some pictures that look like them. Eliminate the items on the bottom page that are different from the standard on the top

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until only one item remains, which will be the one "just like" the standard. Then, point to the item."

3. Impulsive Instructions: "Remember the task you did before? Let's do it differently." "I'm going to show you some pictures of some things you know and some pictures that look like them. If you don't see any difference between an item on the bottom and the standard on top, choose the item by pointing to it.

Following these instructions, the alternate six-item MFF was administered to each subject. As before, the experimenter recorded response latency and number of errors for each item.

Design

The experimental design was a 2 (Reflective-Impulsive) X 3 (Instructions) factorial design with ten subjects per cell.

Results

First Administration of MFF

The expected inverse relationship between mean response latency and number of errors for the 118 subjects who were administered the MFF was significant (r=-.56, df= 116, $p < .001$). The magnitude and direction of this relationship is consistent with previous research with children (Kagan, 1965a, r=.27 to -.75). Thus, the dimension of reflection-impulsivity seems to be manifest in adults as well as children.

Means and standard deviations for both mean response latencies and number of errors for each R-I X Instruction subgroup on the first administration of the MFF are presented in Table 1.

Insert Table 1 about here

Two separate 2 (R-I) X 3 (Instructions) analyses of variance were performed; one on the mean latencies and the other on the number of errors. For latencies, the highly significant main effect of R-I (F=71.43, df=1/54, $p < .001$) indicated that the mean latency for reflectives (53.70 seconds) was significantly greater than that for impulsives (14.43 seconds); neither the main effect of Instructions nor the R-I X Instructions interaction was significant ($F < 1.00$, $p > .10$). For errors, the highly significant main effect of R-I (F=125.42, df=1/54, $p < .001$) indicated that the mean number of errors for impulsives (12.27) was significantly greater than that for reflectives (4.30); neither the main effect of Instructions nor the R-I X Instructions interaction was significant ($F < 1.00$, $p > .10$). Thus, reflective subjects in the three instructional conditions were equivalent in their initial performance, as were the three groups of impulsive subjects.

Second Administration of MFF

For the 20 subjects who were administered the two forms of the MFF under the same (i.e., standard) instructions, test-retest reliability over the two week period was extremely high for latencies (r=.93, df=18, $p < .001$), and also highly significant for errors (r=.58, df=18, $p < .01$).

The means and standard deviations for both latencies and errors on the second administration of the MFF for each R-I X Instruction subgroup are presented in Table 2.

Insert Table 2 about here

Since the primary hypotheses were concerned with instructional effects within groups of reflective and impulsive subjects, and since the mean latencies and errors for the two groups were so disparate, separate one-way analyses of

variance 3 (Instructions) X 1 (Subjects) were performed on the mean latencies and numbers of errors for the impulsive and reflective subjects separately. As predicted, the analysis of variance of mean latencies of impulsive subjects yielded a significant effect of Instructions (F=4.40, df=2/27, $p < .025$). Duncan's New Multiple Range Test indicated that the mean latency for impulsive subjects tested with "reflective" instructions was significantly longer than that for impulsive subjects under either "standard" or "impulsive" instructions ($p < .05$); the latter two conditions did not differ significantly. Contrary to prediction, the analysis of variance on number of errors of impulsive subjects yielded no significant effect of Instructions (F= 1.04, df-2/27, $p > .10$); that is, "reflective" instructions did not significantly decrease errors, relative to the other two instructional conditions. Performance of the reflective subjects on the second administration of the MFF was essentially independent of Instructions: Both analyses on latencies and errors yielded nonsignificant effects of Instructions ($F < 1.00$).

In order to insure that the above effects were due specifically to the instructional manipulation and independent of a general improvement in performance on the second MFF administration, a difference score was computed for each subject for errors and latency. That is, for each subject, his mean latency on session 1 was subtracted from her mean latency on session 2, and the number of errors on session 2 was subtracted from the number of errors on session 1 (so that the score would be positive). These difference scores were then subjected to separate 3 (Instructions) X 1 (Subjects) analyses of variance for the reflective and impulsive subjects separately. As had been found with the measures for session 2, only the analysis of the latency differences for the impulsive subjects yielded a highly significant effect of Instructions (F=10.32, df=2/29, $p < .001$). Duncan's New Multiple Range test indicated that the increase in latency for impulsive subjects given "reflective" instructions (20.60) was significantly greater than the

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increase for impulsive subjects given either "standard" (5.10 seconds) or "impulsive" (6.35) instructions ($p < .05$). The analyses of difference scores of errors for impulsive subjects and of both latency and errors for reflective subjects yielded no significant effects of instructions ($F=1.06$, $df=2/29$, $p > .10$).

Discussion

As predicted, response latencies and errors were stable for both reflective and impulsive adult subjects over two administrations of the MFF under identical (i.e., standard) instructions. Both test-retest correlations for latencies and errors were significant and positive. In addition, analyses of difference scores indicated that there was relatively little change between the scores for sessions 1 and 2 for these subjects.

Also as predicted, the latencies of impulsive subjects were significantly increased when these subjects were tested under "reflective" instructions. Contrary to expectation, "reflective" instructions did not seem to exert any significant effect on their errors. Also contrary to prediction, "impulsive" instructions did not exert any significant effect on either latencies or errors of reflective subjects. Ridberg, et al. (1971) also found reflective subjects resistant to change. They argued that impulsive subject has received more negative feed back during the initial testing and thus might be less confident in his "strategy" and thus is more likely to change given an alternative strategy. This might well explain the latency scores of impulsive subjects which were increased with "reflective" instructions on the second administration of the MFF. The reflective subjects who are, by this argument, confident that they know the proper way to solve the task are less likely to be influenced through verbal instructions, and thus their performance remained essentially unchanged. This argument cannot explain why the errors of impulsive subjects were resistant to change, while their latencies were modifiable. At present, this finding is puzzling and not readily explainable in light of

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the paucity of research on modification of cognitive style in adults. No study to date has been able to modify the latency scores as well as error scores of both reflective and impulsive subjects.

Thus, the present research seems to indicate that adult cognitive style differences are identifiable, stable and not easily modified by verbal instructions. Certainly a developmental study across many ages, including adults and the elderly, would help indicate what changes occur with age, and also the processes underlying those changes. Furthermore, a developmental approach might be able to specify the period(s) during which cognitive style is most amenable to modification. Since reflection-impulsivity, is related to the performance of children on a variety of perceptual learning tasks it would be of interest to explore the behavioral correlates of reflection-impulsivity with adults.

Since instructions alone seem not sufficient to modify both the response times and errors of reflective and impulsive subjects, perhaps and additional instructional component (e.g., latency cues or attention deployment strategies) is necessary to produce significant changes.

The educational implications of these results seem straight forward: instructions, by themselves, may not always modify a student's performance; they may have only minimal effects on the behavior of some students and virtually no effect on that of others.

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Table 1

Means and Standard Deviations for Mean Latencies and Number of Errors: First MFF Administration

Instructional	Latency (Seconds)					Errors				
	Reflectives			Impulsives		Reflectives			Impulsives	
	N	X	S.D.	X	S.D.	N	X	S.D.	X	S.D.
Impulsive	10	53.55	22.66	15.50	4.05	10	4.20	1.07	11.90	2.60
Reflective	10	55.00	23.62	13.05	6.29	10	4.90	1.29	11.90	3.48
Standard	10	52.55	20.02	14.75	5.50	10	3.80	1.23	13.00	4.47
All	30	53.70	23.62	14.43	5.90	30	4.30	1.49	12.27	5.59

Table 2

Means and Standard Deviations for Mean Latencies and Number of Errors: Second MFF Administration

	Dependent Variable									
	Latency (Seconds)					Errors				
Instructional		Reflectives		Impulsives			Reflectives		Impulsives	
Group	N	X	S.D.	X	S.D.	N	X	S.D.	X	S.D.
Impulsive	10	57.30	22.24	21.85	7.34	10	3.30	2.71	8.00	4.16
Reflective	10	61.65	22.63	33.65	14.88	10	2.50	1.84	5.90	2.47
Standard	10	51.55	24.14	19.85	10.18	10	2.60	2.37	6.80	2.94
All	30	56.83	23.05	25.12	26.13	30	2.80	2.71	6.90	4.67

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